APPARATUS FOR INSTALLING FRAMING MATERIAL HANGERS

[0001] This application claims the benefit of U.S. Provisional Application No. 60/459,012, filed 31 March 2003, and U.S. Patent Application No. 10/734,837 filed 12 December 2003, which are hereby incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

1. Technical Field

[0002] The present invention relates to hangers for framing materials in general, and to apparatus and methods for installing one or more hangers into framing material in particular.

2. Background Information

[0003] Framing materials such as picture frames, artwork frames, and the like are often include one or more hangers attached to the back surface of the frame for hanging purposes. The hanger typically includes a cross member extending between a pair of posts. The posts are inserted a distance into the frame, leaving the cross member spaced apart from the frame. Presently available hangers are often inserted manually.

[0004] What is needed is a hanger and an apparatus for installing framing material hangers that permits the automation of hanger installation.

DISCLOSURE OF THE INVENTION

[0005] According to the present invention, an apparatus for installing framing material hangers in a workpiece is provided that includes a selectively operable actuator, a guide assembly, and a magazine. The actuator includes a piston. The guide assembly is operable to guide a framing material hanger into the workpiece. The magazine is operable to feed one or more framing material hangers into the guide assembly. Operating the actuator causes the piston to drive at least one of the hangers through the guide assembly and into the workpiece.

[0006] According to an aspect of the present invention, a stack of hangers is provided. The individual hangers within the stack are attached to one another by tabs, or other means for attaching adjacent hangers.

[0007] According to another aspect of the present invention, a portable hand tool is provided having an actuator and a magazine similar to that described above.

[0008] These and other objects, features, and advantages of the present invention will become apparent in light of the detailed description of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a diagrammatic front view of an embodiment of the present apparatus for installing framing material hangers.

[0010] FIG. 2 is a diagrammatic side view of the embodiment of the present apparatus shown in FIG.1, showing the magazine sectioned and omitting the clamp mechanism.

[0011] FIG. 3A is a diagrammatic partial front view of an embodiment of the present apparatus plunger.

[0012] FIG. 3B is a diagrammatic partial side view of an embodiment of the present apparatus plunger

[0013] FIG. 4 is a diagrammatic sectioned top view of the guide assembly.

[0014] FIG. 5 is a diagrammatic, partially sectioned, front view of an embodiment of the guide assembly, magazine, and clamp mechanism.

[0015] FIG. 6 is a diagrammatic view of an embodiment of a side member portion of the guide assembly, illustrating the channel aperture.

[0016] FIG. 7 is a diagrammatic sectioned view of the magazine.

[0017] FIG. 8 is a diagrammatic top view of a hanger.

[0018] FIG. 9 is an end view of a hanger.

[0019] FIG. 10 is a side view of a two hangers within a stack of the hangers.

[0020] FIG. 11 is a side view of a stack of hangers.

[0021] FIG.12 is a top view of a stack of hangers.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Referring to FIGS. 1 and 2, an apparatus 10 for installing framing

material hangers 12 in a workpiece 14 is provided that includes a selectively operable hanger actuator 16, a support frame 18, a guide assembly 20, and a magazine 22.

[0023] The selectively operable hanger actuator 16 includes a piston 24 that is extendable a distance between a first position and a second position. The change in position of the piston 24 between positions may also be referred to hereinafter as the "stroke" of the piston 24. The magnitude of the distance between the first and second positions may be preset, or it may be variable. As will be described below, the hanger actuator 16 is typically positioned such that the piston stroke travels vertically (i.e., along a z-axis). The hanger actuator 16 is not limited to any particular type and can be, for example, pneumatic, hydraulic, electrical, etc. For purposes of providing the present detailed description, the hanger actuator 16 will be discussed below as being a pneumatic cylinder but is not limited thereto. The pneumatic cylinder and the controllers (solenoid valves, etc.) that control it are known and commercially available. A foot operated type switch can be used to signal the controller.

[0024] Referring to FIGS. 3A and 3B, a plunger 26 is attached to the hanger actuator piston 24. The plunger 26 has a cross-sectional geometry that mates with a cross-sectional geometry of the guide assembly 20 described below; i.e., the plunger 26 is slidably receivable within the guide assembly 20 . The plunger 26 includes a contact face 30 that is shaped to mate with the hanger 12. For example, an embodiment of the hanger 12 (described in detail below - see FIGS. 8 - 12) includes a web 34 that extends between a pair of legs 36. The web 34 has a raised mid-section 38 disposed between a pair of substantially coplanar shoulder portions 40, 42. Now referring back to FIGS. 3A and 3B, in this example the contact face 30 has a geometry that accommodates the coplanar shoulder portions 40, 42 and the raised midsection 38; e.g., a pocket 31 disposed between a pair of coplanar flat surfaces 33. In some embodiments, the plunger 26 includes a retention mechanism 54 for attaching the to-be-installed hanger 12 to the plunger 26. In the embodiment shown in FIGS. 3A and 3B, for example, the plunger 26 includes a pair of magnets 27 operable to attach the to-be-installed hanger 12 to the plunger 26. The retention mechanism 54 is not limited to magnets, however. The plunger 26 contact face 30 also includes one or more widthwise positioning tabs 56 operable to locate the to-be-installed hanger 12 along a line extending substantially parallel to the width of the hanger 12.

[0025] Now referring to FIGS. 1 and 2, the hanger actuator 16 is mounted on the support frame 18, which includes an L-shaped arm 58, and a mounting plate 60. In some embodiments, the support frame 18 includes a base panel 62 for supporting a framing material workpiece 14. In other embodiments, the support frame 18 is configured for use with an independent bench that is operable to support a framing material workpiece 14. In still other embodiments, the support frame 18 is a platform-mounted device that is, for example, mountable on a bench. The platform-mounted embodiment may include a base panel 62 or may be configured so that the bench supports the framing material 14. The L-shaped arm 58 typically includes one or more gussets 64 that stiffen the structure. The mounting plate 60 includes bolt patterns for mounting various components; e.g., the hanger actuator 16, guide assembly 20, etc. The base panel 62, where used, includes a width 66 and a length 68. The upper surface 70 of the base panel 62 may include gradations (e.g., a scale denoting inches and portions thereof) extending widthwise and lengthwise along the base panel 62. In the embodiments where the support frame 18 includes a base panel 62, the support frame 18 may also include one or both of a back panel 72 and a side panel 74.

[0026] The back panel 72 and side panel 74 each may be fixed or selectively positionable relative to the base panel 62. Each panel 72, 74 typically has a cross-sectional geometry that extends away from, and is approximately perpendicular to, the base panel 62. The cross-sectional geometry of one or both of the back panel 72 and side panel 74 can alternatively be contoured to match the cross-sectional geometry of the framing material workpiece 14. Each panel 72, 74 can extend straight or can extend along an arcuate path (or other non-straight path) to accommodate a frame material perimeter shape. Each panel 72, 74 may also include gradations to facilitate positioning of the framing material workpiece 14 relative to the hanger actuator 16.

[0027] In some embodiments, the base panel 62 includes a workpiece support 76 that can be positioned to support a portion of the workpiece 14 in which the hanger 12 is being inserted. Very often, framing material workpieces 14 will have an asymmetrical cross-sectional profile that results in a portion of the workpiece 14 being in contact with the base panel 62, and another portion being out of contact with the base panel 62. The workpiece support 76 is positionable under the portion of the

workpiece 14 out of contact with the base panel 62, proximate the point where the hanger 12 is to be installed. The workpiece support 76 contacts and supports the workpiece 14 during the installation. In a first embodiment, the workpiece support 76 has an arcuate profile that is generic to the workpiece cross-sectional profile. The circular support shown in FIGS. 1 and 2 is an example of workpiece support 76 having a generic cross-sectional profile. Alternatively, the workpiece support 76 may have a cross-sectional profile that mates with the cross-sectional profile of the framing material workpiece 14.

[0028] The workpiece support 76 may be positionable relative to the hanger actuator 16 to accommodate asymmetrical positioning relative to the hanger actuator 16. For example, it is often desirable to install a hanger 12 on each of two opposite frame members so that a picture wire (or other support member) may be strung therebetween. If the frame member 14 has an asymmetrical cross-sectional profile, the desired relative positions of the hanger actuator 16, the frame member 14, and the workpiece support 76 will be different for each side of the frame. To accommodate both side frame members 14, the workpiece support 76 may be selectively moved to the desired position. Alternatively, two or more workpiece supports 76 can be mounted on the base panel 62. In some embodiments, one or more of the workpiece supports 76 may be retractable within the base panel 62. In such an arrangement, a first workpiece support 76 can be selectively actuated into contact with the framing material workpiece 14 when the hanger 12 is installed, and subsequently retracted to permit the framing material workpiece 14 to be moved for the next hanger 12 installation. A second workpiece support 76 would then likewise be selectively actuated into contact with the framing material workpiece 14, and subsequently retracted after installation. The first and second workpiece supports 76 may be independent of one another or joined together.

[0029] The guide assembly 20 of the apparatus 10 is attached to the mounting plate 60. The guide assembly 20 has an internal aperture 78 with a cross-sectional geometry that mates with the cross-sectional geometry of the plunger 26, as indicated above. The guide assembly 20 is operable to guide the plunger 26 and a hanger 12 as they travel away from the magazine 22, toward the workpiece 14. The guide assembly 20 can assume a variety of different configurations, and is not, therefore limited to any particular configuration.

[0030] In the embodiment shown in FIGS. 4 - 6, for example, the guide assembly 20 includes a first side member 80, a second side member 82, an inner lateral member 84, an outer lateral member 86, and a stationary shear block 88. The first side member 80 is attached to the mounting plate 60 on a first side of the plunger 26. The first side member 80 (see FIG. 6) includes a channel aperture 90 having a geometry that conforms with the channel geometry of the magazine 22 as will be described below. The second side member 82 is attached to the mounting plate 60 on a second side of the plunger 26, opposite the first side. The inner and outer lateral members 84, 86 are attached to, and extend between, the first and second side members 80, 82. The stationary shear block 88 is disposed between the inner and outer lateral members 84, 86, attached to one or more of the first side member 80, inner lateral member 84, or outer lateral side member 86. The internal aperture 78 of the channel structure 32 is formed between the inner and outer lateral members 84, 86, the second side member 82, and the stationary shear block 88.

[0031] Referring to FIGS. 1, 4 and 7, the magazine 22 includes a channel 92, a fill end 94, an actuator end 96, and a biasing mechanism 98. The cross-sectional geometry of the channel 92 is such that the body 100 of the channel fits between the legs 36 of a hanger 12, where the legs 36 of the hanger 12 are disposed on opposite lengthwise ends of the web 34. In some embodiments, the channel 92 includes a flange 102 disposed on each side of the body 100. The flanges 102 are spaced apart from an upper surface 104 of the body 100 by a distance approximately equal to the length of the legs 36. The cross-sectional geometry of the channel 92, the orientation of the magazine 22 relative to the hanger actuator 16 (i.e., extending along the y-axis), and the length of the magazine 22 permits a stack 52 of hangers 12, arranged back-to-back, to be disposed on top of and guided within the channel 92.

[0032] The biasing mechanism 98 is operable to bias the hangers 12 within the channel 92 toward the hanger actuator 16. A variety of biasing mechanisms can be used. For example, the biasing mechanism 98 shown in FIG. 1 includes a coiled spring 106 and a block 108. One end of the coiled spring 106 is fixed adjacent the hanger actuator 16 and the other end is fixed to the block 108 that is slidably attached to the channel 92. The block 108 is movable toward the fill end 94 of the magazine 22 to permit the insertion of hangers 12 within the magazine 22. Once, the hangers 12 are inserted, the block 108 is drawn into contact with the hangers 12 and biases

them toward the actuator end 96 of the magazine 22. As the block 108 travels toward the actuator end 96 of the magazine 22, the coiled spring 106 is recoiled. In some embodiments, a detent 109 (e.g., a magnet, a mechanical latch, etc.) is provided adjacent the fill end of the magazine 22. The detent 109 selectively holds the block 108 stationary to facilitate hanger 12 loading, etc. The biasing mechanism 98 is not limited to the embodiment described above.

[0033] In the embodiment shown in FIGS. 1 and 5, the present apparatus 10 includes a clamp mechanism 110 for positionally holding the hangers 12 within the magazine 22. The clamp mechanism 110 includes a clamp actuator 112 having a rod 114 and a rod end 116. The rod 114 is extendable a distance between a retracted position and an extended position. The clamp mechanism 110 is positioned adjacent the actuator end of the magazine 22. In the retracted position, the rod end 116 is not engaged with the hangers 12 within the magazine 22; i.e., the hangers 12 can slide toward the actuator end 96 of the magazine 22. In the extended position, the rod end 116 engages hangers 12 within the magazine 22, and thereby prevents the hangers 12 from moving toward the actuator end 96 of the magazine 22. The rod end 116 also holds the next to last hanger 12 stationary when the tabs 126 (described below) connecting the last two hangers 12 are sheared. The clamp actuator 112 and the associated controls (solenoid valves, etc.) are preferably known and commercially available pneumatic-type devices. The clamp actuator 112 and associated controls are not, however, limited to pneumatic-type devices and can be, for example, hydraulic, electrical, etc.

[0034] Referring to FIGS. 8 - 12, the various embodiments of the present apparatus 10 can be used with a variety of different hangers 12. The present apparatus 10 is not, therefore, limited to use with any particular hanger 12. In most instances, each hanger 12 has a web 34 that extends lengthwise between at least a pair of legs 36. The legs 36 are disposed at each lengthwise end 118, 120 of the web 34, and are oriented substantially perpendicular to the web 34. For purposes of orientation, the length 122 of the hanger 12 is defined as extending across the web 34 between the lengthwise ends 118, 120. The width 124 of the hanger 12 is defined as extending across the web 34 along a line substantially perpendicular to the length 122.

[0035] In a preferred embodiment, the hanger 12 includes a web 34 having a first shoulder portion 40, a second shoulder portion 42, and a midsection 38 disposed

between the shoulder portions 40, 42. The shoulder portions 40, 42 are substantially coplanar. Each shoulder portion 40, 42 preferably includes an aperture 44 sized to receive a fastener. The midsection 38 is arcuately shaped and raised from the plane in which the shoulder portions 40, 42 are disposed, and preferably has a narrowed central section 46. In some embodiments, the midsection 38 includes flanges 48 that increase the thickness of the midsection 38 along the lengthwise extending edges and thereby strengthen the midsection 38. In the embodiment shown in FIGS. 8 - 12, the flanges 48 are extensions of the midsection 38, rolled back onto the midsection 38. The rounded edge created by the rolled-back edge provides the additional advantage of a smooth edge that is less apt to wear a member tied to the midsection 38. This midsection 38 configuration lends itself to a stamping-type manufacturing process. Alternative hanger 12 embodiments may include structural features other than the aforesaid flanges 48 to increase the strength of the web 34 mid-section. The narrowed central section 46 provides advantage because it is operable to centrally locate a member tied to the midsection 38. As a result, the uniformity of positioning between hangers 12 is increased.

[0036] In some embodiments, the legs 36 of the hanger 12 are formed as barbed members, each having a "fir-tree" type configuration. The barbed members facilitate insertion into, and retention within, the framing material workpiece 14. The hanger 12 embodiment shown in FIGS. 10 - 12 includes four legs 36, two one each lengthwise end of the web 34. Alternative embodiments may have a different number of legs 36. The legs 36 are shaped to allow the hanger 12 to be inserted into the framing material workpiece 14 in a manner that the shoulder portions 40, 42 of the web 34 contact the framing material workpiece 14. When the shoulder portions 40, 42 are in contact with (or in close proximity to) the framing material workpiece 14, the raised midsection 38 forms an opening with the framing material workpiece 14 through which picture wire or the like can be inserted. In the preferred embodiment, a gusset 50 is disposed between the respective shoulder portion 40, 42 and each of the legs 36.

[0037] The present apparatus 10 can be used with individual hangers 12 loaded into the magazine 22, or it can be used with a stack 52 of hangers 12 joined to one another. In a preferred embodiment, adjacent hangers 12 within a stack 52 are joined together by one or more tabs 126 extending between the adjacent hangers 12. The

tabs 126 are configured such that they may be sheared during operation of the apparatus 10 as will be described below. In some embodiments, the tabs 126 include features 128 that facilitate the shearing process, also referred to herein as "shear features". For example, the tabs 126 shown in FIG. 10 have a slot 130 that decreases the thickness of the tab 126, and a narrowed portion 131 (see also FIGS. 8 and 12) that decreases the width of the tab 126. The hangers 12 within a stack 52 can alternatively be attached to one another by means other than a tab; e.g., glue, tape, etc., although the aforesaid tabs 126 obviate the need to add glue, tape, etc. to join the hangers 12.

[0038] The orientation of the hangers 12 within the stack 52 is chosen to agree with the cross-sectional geometry of the magazine 22. For example, the hangers 12 within the stack 52 shown in FIGS. 11 and 12 are oriented such that the webs 34 of adjacent hangers 12 are substantially parallel and spaced apart from one another. A tab 126 extends between adjacent shoulder portions within the stack 52 to connect the adjacent hangers 12 and thereby form the stack 52. The magazine 22 shown in FIGS. 1, 4 and 5 is configured to receive such a stack 52. In an alternative embodiment, the hangers 12 within the stack 52 may be orientated such that the legs 36 of the hangers 12 within the stack 52 are substantially aligned along a single line. In that case, one or more tabs 126 may extend between adjacent legs 36 of adjacent hangers 12.

[0039] Referring to FIGS. 1 - 12, in the operation of the apparatus 10 for installing framing material hangers 12, the hanger actuator 16 is positioned a predetermined distance from the base panel 62 (or bench). Depending upon the configuration of the apparatus 10, that distance may be fixed or adjustable. At a minimum, the distance permits the current framing material workpiece 14 to be inserted between the hanger actuator 16 and the base panel 62 (or bench).

[0040] The hanger actuator 16 is normally maintained in a retracted position; i.e., the piston 24 is retracted within the hanger actuator 16. In the retracted position, the plunger 26 attached to the piston 24 is positioned to permit movement of a hanger 12 from the magazine 22 into the internal aperture 78 of the guide assembly 20.

[0041] A plurality of single hangers 12, or a stack 52 of hangers 12, is loaded into the magazine 22. If the apparatus 10 includes a detent 109 adjacent the fill end

94 of the magazine 22, the detent 109 can be used to selectively hold the block 108 portion of the biasing mechanism 98 stationary to facilitate hanger 12 loading. Once the magazine 22 is loaded, the biasing mechanism 98 biases the hangers 12 loaded within the magazine 22 toward the actuator end 96 of the magazine 22. The hanger 12 closest to the actuator end 96 of the magazine 22 is disposed within the internal aperture 78 of the guide assembly 20.

[0042] In those embodiments that include a clamp mechanism 110, the clamp actuator 112 is preferably set in the retracted position prior to loading the hangers 12 within magazine 22. Once the magazine 22 is loaded, the clamp mechanism 110 may be actuated into the extended position, thereby positionally holding the hangers 12 relative to the magazine 22.

[0043] To install a hanger 12 into a framing material workpiece 14, the framing material workpiece 14 is placed on the base panel 62 and inserted between the hanger actuator 16 and the base panel 62 (or bench). The framing material workpiece 14 is positioned relative to the hanger actuator 16 to insure that the hanger 12 is installed at the desired position within the framing material workpiece 14. In those embodiments that include gradations marked within the base panel 62, the user can locate the framing material workpiece 14 relative to the actuator using the gradations. In those embodiments that include a back panel 72, the back panel 72 is attached to the base panel 62 and spaced apart from the hanger actuator 16.

[0044] As stated above, in some embodiments one or both of the hanger actuator 16 and back panel 72 are selectively positionable along a fore and aft extending line, parallel to the base panel 62 (e.g., y-axis). In such a case, the back panel 72 and hanger actuator 16 are relatively separated by a distance that corresponds to the distance between the outer edge of the framing material workpiece 14 and the position at where the installation of the hanger 12 is desired. Using the back panel 72 obviates the need to locate the framing material workpiece 14 relative to the hanger actuator 16; e.g., by gradations on the base panel 62. Instead, the back panel 72 can be located relative to the base panel 62. Either way, once the back panel 72 is positioned and secured to the base panel 62, a plurality of framing material workpieces 14 can be processed by placing the framing material in contact with the back panel 72.

[0045] In some embodiments, once the framing material workpiece 14 is in the desired position, a workpiece support is positioned under the portion of the workpiece 14 that is out of contact with the base panel 62, proximate the point where the hanger 12 is to be installed. The workpiece support 76 contacts and supports the workpiece 14 during the installation. In those embodiments where a plurality of workpiece supports 76 are provided to accommodate frame members having asymmetrical cross-sectional profiles, a first workpiece support 76 is positioned so that it will be in contact with the framing material workpiece 14 when the hanger 12 is installed on one side of the frame. The first workpiece support 76 may then be removed (or actuated out of the way) to facilitate movement of the frame. A second workpiece support 76 is positioned so that it will be in contact with the framing material workpiece 14 from the opposite side of the frame, when that workpiece 14 is positioned for hanger 12 installation. A variety of workpiece support 76 configurations can be used with the present invention, and the present invention is not, therefore, limited to use with any particular configuration.

[0046] Once the framing material workpiece 14 is in the desired position, the actuator controller can be switched (e.g., by foot pedal, hand-operated switch, etc.) by the operator to cause a hanger 12 to be installed within the framing material workpiece 14.

[0047] Once the controller is switched, the controller causes the piston 24 of the selectively operable hanger actuator 16 and the attached plunger 26 to extend outwardly and into contact with a hanger 12. The piston 24 drives the hanger 12 out of the guide assembly 20. If the hanger 12 is part of a stack 52 of hangers 12, the process of driving the hanger 12 out of the guide assembly 20 causes the hanger 12 to separate from the stack 52. If the stack 52 comprises a plurality of hangers 12 attached to one another by tabs 126, as described above, the force of the hanger actuator 16 causes the one or more tabs 126 to shear, thereby separating the hanger 12 from the stack 52. In those embodiments where the plunger 26 includes a retention mechanism 54, the retention mechanism 54 attaches the hanger 12 to the plunger 26 as the plunger 26 travels toward the framing material workpiece 14. The hanger actuator 16 subsequently drives the hanger 12 into the framing material workpiece 14 disposed between the base panel 62 and the hanger actuator 16.

[0048] The amount the hanger 12 is driven into the framing material workpiece

14 can be determined by the amount of force applied by the hanger actuator 16, or by the distance of the piston stroke. In the case of the hanger 12 having a plurality of barbed legs 36, for example, an amount of force (or distance) is preferably chosen that enables the barbed members to be completely inserted into the framing material workpiece 14, and the shoulder portions 40 places 34 into contact with the framing material. In that position, the midsection 38 of the hanger 12 is left spaced apart from the framing material workpiece 14.

[0049] Once the hanger 12 is driven into the framing material, the controller causes the piston 24 to retract within the hanger actuator 16. In those embodiments that utilize a retention mechanism 54, the force holding the hanger 12 to the plunger 26 is substantially less than the forces attaching the hanger 12 to the framing material 14. Consequently, the plunger 26 readily separates from the now installed hanger 12. When the piston 24 is retracted to its initial position, the plunger 26 and attached plunger 26 are also returned to their initial position.

[0050] Once the piston 24 and plunger 26 are returned to their initial retracted positions, the clamp actuator 112 moves to its retracted position and allows the biasing mechanism 98 to drive the hangers 12 within the magazine 22 toward the actuator end of the magazine 22. The movement of the hangers 12 ends when the hanger 12 closest to the actuator end of the magazine 22 is disposed within the internal aperture 78 of the guide assembly 20. Once, the hangers 12 are properly positioned, the clamp actuator 112 moves to its extended position and thereby positionally holds the hangers 12 relative to the magazine 22. At this point, the apparatus 10 is ready to install the next hanger 12.

[0051] In those applications where a pair of hangers 12 are to be installed in a frame 14, one on each opposite frame member 14, and where the frame members 14 have asymmetrical cross-sectional profiles, it is desirable to utilize one workpiece support 76 that can be selectively positioned relative to the hanger actuator 16, or a plurality of workpiece supports 76 that can be selectively positioned relative to the hanger actuator 16. In both instances, a first workpiece support 76 is positioned in a manner that enables it to support the frame member 14 on one side of the frame. Once that hanger 12 is installed, that workpiece support 76 is typically moved to a second position. Alternatively, that workpiece support 76 can be removed in favor of a second workpiece support 76.

[0052] Although this invention has been shown and described with respect to the detailed embodiments thereof, it will be understood by those skilled in the art that various changes in form and detail thereof may be made without departing from the spirit and scope of the invention. For example, aspects of the above-described apparatus 10 can be incorporated into a portable hand tool version. The portable hand tool version includes an actuator and a magazine 22. The actuator and magazine 22 are similar to those described above.

[0053] What is claimed is: